2018 Physics Education Research Conference

Table of Contents

Preface 10

Conference Overview 13

Conference Program 14

Introduction

PLENARY PAPER

The multimodal interactional work of having wonderful ideas
Benedikt W. Harrer 18

PEER REVIEWED PAPERS

Promoting Students’ Conceptual Knowledge using Video Analysis on Tablet Computers
Sebastian Becker, Pascal Klein, and Jochen Kuhn 23

NoNIP: Natures of Negativity in Introductory Physics
Suzanne W. Brahmia, Alexis Olsho, Trevor I. Smith, and Andrew Boudreaux 27

Algebra-based students & vectors: can $ijk$ coaching improve arrow subtraction?
John B. Buncher 31

Using reflections to explore student learning during the project component of an advanced laboratory course
Bei Cai, Lindsay Mainhood, and Robert G. Knobel 35

Student Expectations, Classroom Community, and Values Reported on Group Exams
Erik Tyler Carr, Timothy M. Sault, and Steven F. Wolf 39

Curriculum development to improve student understanding of rolling motion
Sheh Lit Chang and Peter S. Shaffer 43

Understanding the graduate school selection process from students’ perspectives
Deepa Chari and Geoff Potvin 47

Measuring the effectiveness of online problem-solving tutorials by multi-level knowledge transfer
Zhongzhou Chen, Kyle M. Whitcomb, and Chandralekha Singh 51

Examining physics identity development through two high school interventions
Hemeng Cheng, Geoff Potvin, Raina Khatri, Laird Kramer, Robynne M. Lock, and Zahra Hazari 55

Development of a Rubric for Improved Understanding of IPLS Curricula
Warren Christensen, Aeowynn Coakley, Jordan Brainard, Kimberly Austin, Elliot Mylott, and Ralf Widenhorn 59

Externalizing the Core Principles of the Departmental Action Team (DAT) model
Joel C. Corbo, Gina M. Quan, Karen Falkenberg, Christopher Geanious, Courtney Ngai, Mary E. Pilgrim, Daniel L. Reinholz, and Sarah Wise 63
Conversational norms in faculty communities enable and constrain opportunities to learn
Adriana Corrales, Fred Goldberg, Chandra Turpen, and Edward Price

Effect of peer-review on development of students’ problem-solving abilities
Taylor Crouch and J. Christopher Moore

Assessment of strategies to build a welcoming STEM classroom environment for all students
C. De Grandi, R. Ramos, and S. G. J. Mochrie

What’s happening in traditional and inquiry-based introductory labs? An integrative analysis at a large research university
Danny Doucette, Russell Clark, and Chandralekha Singh

Investigating the relationship between active learning task characteristics and student success
Leanne Doughty, Laurel Hartley, Paul Le, Mary Nyaema, Jeffrey Boyer, and Robert M. Talbot III

Correlating students’ views about experimental physics with their sense of project ownership
Dimitri R. Dounas-Frazer and H. J. Lewandowski

Project Accelerate: Increasing STEM Opportunities for Underserved High School Students
Andrew G. Duffy and Mark D. Greenman

“Eureka!” “That’s funny. . . ”: Problematization and value in two classroom epiphanies scenarios
Gabriel S. Ehrlich and Mats A. Selen

Student Sensemaking about Equipotential Graphs
Paul J. Emigh, Jonathan W. Alfson, and Elizabeth Gire

Developing a conceptual assessment for a modular curriculum
Paula V. Engelhardt, Steve Robinson, Edward P. Price, P. Sean Smith, and Fred Goldberg

Towards understanding learning challenges involving sign convention in introductory level kinematics
Moa Eriksson, Cedric Linder, Urban Eriksson

Student experiences in traditional and active learning classrooms in introductory physics courses
Whitney Faries, Robin Gordon, and Benjamin W. Dreyfus

A Design-Based Informal Physics Program from a Youth Perspective
Brett L. Friedler, Claudia Fracchiolla, Michael B. Bennett, Kathleen Hinko, and Noah D. Finkelstein

Characterizing Models of Informal Physics Programs
Claudia Fracchiolla, Noah Finkelstein, and Kathleen Hinko

Uncovering the unknown unknowns of Peer Instruction questions
Rica Sirbaugh French and Edward Prather

What counts in laboratories: toward a practice-based identity survey
Kelsey Funkhouser, Marcos D. Caballero, Paul W. Irving, and Vashti Sawtelle

Facilitators and outcomes of STEM-education groups working toward disciplinary integration
Juliana L. Fuqua, Jeffrey A. Phillips, Anna Bargagliotti, and Dorothea Herreiner

Examining the productiveness of student resources in a problem-solving interview
Lisa M. Goodhew, Amy D. Robertson, Paula R.L. Heron, and Rachel E. Scherr
Denoting and Comparing Leadership Attributes and Behaviors in Group Work
Kristina Griswold, Daryl McPadden, Marcos D. Caballero, and Paul Irving

Effective grain-size of mastery-style online homework levels
Brianne Gutmann, Noah Schroeder, and Tim Stelzer

Learning Assistants as constructors of feedback: How are they impacted?
Patti C. Hamerski, Paul W. Irving, and Daryl McPadden

Characterizing differences in students’ epistemologies between classical and quantum physics
Isaac E.W. Hanemann, Jessica R. Hoehn, and Noah D. Finkelstein

Studying community development: a network analytical approach

Rural and First Generation Performance Differences on the Force and Motion Conceptual Evaluation
Rachel Henderson, Cabot Zabriskie, and John Stewart

Student Outcomes Across Collaborative-Learning Environments
Xochith Herrera, Jayson Nissen, and Ben Van Dusen

How students apply linear algebra to quantum mechanics
Charlotte Hillebrand-Viljoen and Spencer Wheaton

Dynamics of students’ ontological reasoning across contexts in modern physics
Jessica R. Hoehn, Julian D. Gifford, and Noah D. Finkelstein

Performing Physics: An Analysis of Design-Based Informal STEAM Education Programs
Simone Hyater-Adams, Noah Finkelstein, and Kathleen Hinko

How freshmen generate evidence for reasoning in physics and non-physics tasks?
Bashirah Ibrahim and Lin Ding

Beyond disability as weakness: Perspectives from students with disabilities
Westley James, Caroline Bustamante, Kamryn Lamons, and Jacqueelyn J. Chini

How social-media and web-accessible learning resources influence students’ experiences in a quantum physics course: A case study
Brandon James Johnson, Erin Ronayne Sohr, and Ayush Gupta

Development and validation of a sequence of clicker questions for helping students learn addition of angular momentum in quantum mechanics
Paul Justice, Emily Marshman, and Chandralekha Singh

Large gender differences in physics self-efficacy at equal performance levels: A warning sign?
Z. Yasemin Kalender, Emily Marshman, Christian D. Schunn, Timothy J. Nokes-Malach, and Chandralekha Singh

Nurturing sensemaking of, through, and with a mathematical model
Shulamit Kapon and Maayan Schwartzer

Student difficulties with the number of distinct many-particle states for a system of non-interacting identical particles with a fixed number of available single-particle states
Christof Keebaugh, Emily Marshman, and Chandralekha Singh
STEM students’ voluntary use of YouTube to learn science topics taught in high school and/or college
Raquib Khan, William W. Cobern, Betty Adams, and Joao R. Amadeu Filho

Visual understanding of divergence and curl: Visual cues promote better learning
Pascal Klein, Jouni Viiri, and Jochen Kuhn

Persistence and career choices of female Finnish university physics students
Alexis V. Knaub and Ramón Barthelemy

Evaluating the presence of response-shift bias in the CLASS with a two-pass survey
W. Brian Lane and Ramesh Y. Adhikari

Describing and facilitating productive teaching talk in a faculty online learning community
Alexandra C. Lau, Melissa H. Dancy, Charles Henderson, and Andy Rundquist

The difficulties associated with integrating computation into undergraduate physics
Ashleigh Leary, Paul W. Irving, and Marcos D. Caballero

Surprise! students don’t do special-case analysis when unaware of it
MacKenzie Lenz, Paul J. Emigh, and Elizabeth Gire

Physics Teacher-Leaders’ Learning in a National Program of Regional Professional Learning Communities
Smadar Levy, Esther Bagno, Hana Berger, and Bat-Sheva Eylon

Initial impacts of the transformation of a large introductory lab course focused on developing experimental skills and expert epistemology
H. J. Lewandowski, Daniel R. Bolton, and Benjamin Pollard

PEER suite: A holistic approach to supporting inductive pedagogy implementation
William E. Lindsay, Valerie K. Otero, and Shelly N. Belleau

Dashboard to evaluate student engagement with interactive simulations
Diana López-Tavares, Katherine Perkins, Sam Reid, Michael Kauzmann, and Carlos Aguirre-Vélez

Determining a hierarchy of correctness through student transitions on the FMCE
Kyle J. Louis, Bartholomew J. Ricci, and Trevor I. Smith

Virtual Reality as a Teaching Tool for Moon Phases and Beyond
J. H. Madden, A. S. Won, J. P. Schuldt, B. Kim, S. Pandita, Y. Sun, T. J. Stone, and N. G. Holmes

Student understanding of measurement and uncertainty: probing the mean
Nuraan Majiet and Saalih Allie

Student difficulties with the corrections to the energy spectrum of the hydrogen atom for the intermediate field Zeeman effect
Emily Marshman, Christof Keebaugh, and Chandralekha Singh

Surveying physics and astronomy students’ attitudes and approaches to problem solving
Andrew Mason, Melanie Good, and Chandralekha Singh

Student interpretation of coefficients in Fourier series
Mikayla Mays and Michael Loverude
Short- and long-term impacts of an informal STEM program
Michele W. McColgan, Robert J. Colesante, and Kenneth Robin

Feedback as a mechanism for improving students’ scientific communication skills
Daryl McPadden, Patti C. Hamerski, Marcos D. Caballero, and Paul W. Irving

Development and validation of a pedagogy-specific problem-solving process rubric
J. Christopher Moore and Taylor Crouch

How students describe infinitesimal sources and infinitesimal spaces in integrals
Gregory Mulder, Paul J. Emigh, and Elizabeth Gire

Validating a survey for self-reporting cognitive load
Jeremy Munsell, Tianlong Zu, and N. Sanjay Rebello

Content analysis of instructor tools for building a learning community
Carissa Myers, Adrienne Traxler, and A. Gavrin

An uncommon case of relevance through everyday experiences
Abhilash Nair and Vashti Sawtelle

Prior preparation and motivational characteristics mediate relations between gender and learning outcomes in introductory physics
Timothy J. Nokes-Malach, Z. Yasemin Kalender, Emily Marshman, Christian D. Schunn, and Chandralekha Singh

Recurring questions that sustain the sensemaking frame
Tor Ole B. Odden and Rosemary S. Russ

“Curriculum swaps” as a pathway into a geographically-distributed instructional community
Alice Olmstead and Chandra Turpen

Misaligned visions for improving graduate diversity: Student characteristics vs. systemic/cultural factors
Lindsay Owens, Benjamin M. Zwickl, Scott V. Franklin, and Casey W. Miller

Talk moves, argumentation, and questioning patterns in LA-supported group problem solving
Alaina Pak, Marissa Mangini, Clare Green, and Tiffany-Rose Sikorski

Students’ choices when solving expectation value problems
Gina Passante, Homeyra Sadaghiani, Steven J. Pollock, and Benjamin P. Schermerhorn

Pondering zeros: Uncovering hidden inequities within a decade of grades
Cassandra Paul, David J. Webb, Mary K. Chessey, and James Lucas

Intervening in status hierarchies to disrupt inequity
Lily Payne and Paul Hutchison

Transforming a large introductory lab course: impacts on views about experimental physics
Benjamin Pollard and H. J. Lewandowski

Designing, validating, and contrasting conceptual quantum mechanics questions for spin states and spatial wave functions
Steven J. Pollock, Homeyra Sadaghiani, Adam Quaal, and Gina Passante
Intense Outreach: Experiences Shifting University Students’ Identities
Brean Prefontaine, Claudia Fracchiolla, Manuel Vasquez, and Kathleen Hinko

How and why do high school teachers use PhET interactive simulations?
Argenta M. Price, Katherine K. Perkins, N.G. Holmes, and Carl E. Wieman

Research on university faculty members’ reasoning about how departments change
Gina M. Quan, Joel C. Corbo, Courtney Ngai, Daniel Reinholz, and Mary E. Pilgrim

Who does what now? How physics lab instruction impacts student behaviors
Katherine N. Quinn, Kathryn L. McGill, Michelle M. Kelley, Emily M. Smith, and N. G. Holmes

Machine learning predicts responses to conceptual tasks using eye movements
N. Sanjay Rebello, Minh Hoai Nguyen, Yang Wang, Tianlong Zu, John Hutson, and Lester C. Loschky

Pathways to proposing causes for unexpected experimental results
Laura Ríos, Benjamin Pollard, Dimitri R. Dounas-Frazer, and H. J. Lewandowski

Belonging, success, access, and disruption: Physics faculty goals for inclusive learning environments
Amy D. Robertson, W. Tali Hairston, and Rachel E. Scherr

Investigating introductory student difficulties reading equipotential diagrams
Rebecca Rosenblatt, Raymond Zich, Amber Sammons, and Jacob Cermak

Roleplaying as tool for helping LAs sense-make about inequitable team dynamics
Hannah Sabo, Jennifer Radoff, Andrew Elby, Ayush Gupta, and Chandra Turpen

Student understanding of quantum mechanical expectation values in two different curricula
Homeyra Sadaghiani, Gina Passante, Steven Pollock

How computation can facilitate sensemaking about physics: A case study
Odd Petter Sand, Tor Ole B. Odden, Christine Lindstrøm, and Marcos D. Caballero

Student Cognition in Physics Group Exams
Timothy Sault, Hunter G. Close, and Steven F. Wolf

Ability profiles: A framework for conceptualizing dimensions of ability
Erin Scanlon and Jacquelyn J. Chini

Development and validation of the Physics Teacher Education Program Analysis (PTEPA) Rubric
Rachel E. Scherr and Stephanie V. Chasteen

Surprise! Shifting students away from model-verifying frames in physics labs
Emily M. Smith, Martin M. Stein, and N.G. Holmes

Examining the relationship between student performance and video interactions
Robert Solli, John M. Aiken, Rachel Henderson, and Marcos D. Caballero

Confirming what we know: Understanding questionable research practices in intro physics labs
Martin M. Stein, Emily M. Smith, and N. G. Holmes

Smartglasses in STEM laboratory courses—the augmented thermal flux experiment
Martin P. Strzys, Michael Thees, Sebastian Kapp, and Jochen Kuhn
Communicating scientific ideas: tutorials for professionally-styled laboratory reports
Kelley D. Sullivan
415

Visualizing patterns in CSEM responses to assess student conceptual understanding
Ryan Tapping, G.P. Lepage, and N.G. Holmes
419

"So it's the same equation...": A blending analysis of student reasoning with functions in kinematics
Henry Taylor and Michael Loverude
423

Confusion and representational practices as factors that sustain rich pedagogical discussions within faculty online learning communities
Chandra Turpen, Fred Goldberg, Adriana Corrales, and Ed Price
427

Variations in patterns of persistence
Adan Vela, Jacquelyn J. Chini, Alexander Baekey, and Joseph Walsh
431

Expert reasoning about independent and dependent variables in thermodynamics
Michael Vignal, Reese R. Siegel, Paul J. Emigh, and Elizabeth Gire
435

Assessment of critical thinking in physics labs: concurrent validity
Cole Walsh, Katherine N. Quinn, and N. G. Holmes
439

Investigating complementary computational and empirical activities for students learning diffusion
Daniel P. Weller, Kathleen Hinko, and Vashti Sawtelle
443

How do introductory physics and mathematics courses impact engineering students’ performance in subsequent engineering courses?
447

Selling the studio style to students: A qualitative study
Matthew Wilcox and Jacquelyn J. Chini
451

The Intersection of Identity and Performing Arts for Black Physicists
Tamia Williams, Simone Hyater-Adams, Kathleen Hinko, Claudia Fracchiolla, Kerstin Nordstrom, and Noah Finkelstein
455

A Comparison of Visual Representations of E&M Plane Waves
Michael Wilson and Robert Beichner
459

Researching experiences in a cohort program to influence transfer self-efficacy
Laura A. Wood, Angela J. Little, Vashti Sawtelle
463

Success is a puzzle: Sorting out the pieces with metaphor analysis
Brian Zamarripa Roman and Jacquelyn J. Chini
467

Meanings of the equals sign in upper-level undergraduate problem solving
Dina Zohrabi Alaee, Eleanor C. Sayre, and Scott V. Franklin
471

List of Participants and E-mail Addresses
475

Index
480
Preface

The theme of the 2018 Physics Education Research (PER) Conference was Having Wonderful Ideas: Connecting the Content, Outcomes, and Pedagogies of Physics. The plenary talks dipped into this theme in several ways. Rosemary Russ, in the Wednesday bridging session, focused on preservice teachers. Benedikt Harrer discussed the multiple modes of communication (speech, gestures, whiteboards, etc.) that teachers and students used to construct and respond to wonderful ideas. Déana Scipio, in the Thursday lunch plenary, explored theory and examples of epistemic agency for students from non-dominant communities in a chemical oceanography laboratory.

A recurring theme through all three plenaries was who is allowed to have wonderful ideas: who is given space to speak in our classrooms and research, what different types of "wonderfulness" say about the values of the listeners, and how making those choices consciously can empower rather than oppress. This resonates with a larger conversation that is gaining volume in physics education research, about how equity and inclusivity can be part of physics education even when springs and ramps are the material on the page. Education has always been political, and more researchers are critically engaging with this reality as our field continues to grow.

Every PERC does some things differently than the year before. In 2018, the no-banquet format continued on Wednesday night, but many people joined breakout "Dine and Discuss" groups. These groups of 6-14 people were organized around themes ranging from labs to being a religious person in physics, and were very popular. Another format shift was to keep longer juried talks, but return those papers to the main peer-reviewed section of the Proceedings. Finally, PERC has often ended with a plenary session or panel. This year, closure was more of a "choose your own adventure," where a panel of plenary speakers ran in parallel with a discussion about teaching implications, a forum for emergent questions from the conference, and an art/music room.

None of this could happen without a team of people every year who bring their vision, energy, and sweat. The 2018 PERC organizers were Amy Robertson, Leslie Atkins Elliott, Andy Elby, and Jen Richards. They were joined by the formidable organizational powers of the American Association of Physics Teachers (AAPT) and the Physics Education Research Leadership and Organizing Council (PERLOC).

The PERC Proceedings online submission and review process was supported by Lyle Barbato and Bruce Mason who work closely with the editors to ensure smooth functioning of the online system. We owe Lyle and Bruce a great deal of thanks. The editors also thank the AAPT for their sponsorship of the Proceedings, allowing it to be published open-access through the comPADRE website.

As in every year, the editors wish to thank the referees for volunteering their time and expertise to give feedback to papers submitted to the Proceedings. This year we had 251 reviewers who reviewed the 153 papers submitted to the Peer Reviewed Section. The PERC Proceedings is both an important archive of findings and also a place where many new members of the field publish their first physics education research, and we are deeply appreciative of the reviewers who make this possible.
Laura Wood, Nicholas Young, Cabot Zabriskie, Daqing Zhang, Raymond Zich, Dina Zohrabi Alae.

Finally, the Editors wish to express our special thanks to the PERC Coordination Committee chaired by Joel Corbo, who facilitated communications and coordinated logistics among multiple parties to streamline the process for future years.

See you Summer 2019 in Provo, Utah!

Adrienne Traxler
Editor-in-Chief
Conference Overview: Having Wonderful Ideas: Connecting the Content, Outcomes, and Pedagogies of Physics

Many physics instructors have educational goals for their students that go beyond understanding physics concepts and problem-solving approaches. These goals can include understanding how physics knowledge is generated, understanding how to learn difficult concepts, learning more general problem-solving skills, developing confidence in physics/science, and developing a physics identity. Our conference theme is inspired by an educational goal articulated by Eleanor Duckworth, a goal connected to the ones just mentioned but different in flavor: "The having of wonderful ideas is what I consider the essence of intellectual development. And I consider it the essence of pedagogy to give [students] the occasion to have [their] wonderful ideas and to let [them] feel good about [themselves] for having them." What does "having wonderful ideas" mean in physics courses and other physics learning environments? Sessions at PERC 2018 will explore this question by focusing on both learners (including students and teacher-learners) and classrooms. At the student level: What are the various ways in which student ideas in physics are wonderful? In what ways can students' ideas challenge our sense of what "counts" as physics? How do our assessments capture wonderful aspects of student thinking? At the classroom level: How do the learning outcomes we identify help us articulate what is wonderful about physics? What are the different ways in which our classrooms are wonderful places to be? Discussing these questions can help us better refine and articulate our goals as physics educators and physics education researchers.

Organizers:
Amy Robertson, Seattle Pacific University
Leslie Atkins Elliott, Boise State University
Andy Elby, University of Maryland College Park
Jen Richards, University of Washington

The organizing committee of the PERC 2018 would like to express gratitude to the following individuals for their invaluable assistance in creating this conference:

The plenary speakers, Benedikt W. Harrer, Rosemary S. Russ, and Déana Scipio; the PERC liaison, Joel Corbo; 2017 PERC organizers who served as advisors through the whole process; Lyle Barbato and Bruce Mason with ComPADRE; Tiffany Hayes, Cerena Cantrell, Janet Lane, and Pearl Watson from AAPT; PERLOC for supporting award plaques; reviewers of juried talk proposals; and the PERC Proceedings Editors: Adrienne Traxler, Ying Cao, and Steven Wolf.
**PROGRAM**

**Wednesday, August 1, 2018**

<table>
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<th>Time</th>
<th>Event</th>
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<td>Renaissance Ballroom</td>
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<td>4:30 PM</td>
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<td><strong>Poster Session I: First Timer/Undergraduate</strong></td>
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**Thursday, August 2, 2018**

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<td>People of Color Discussion &amp; Writing Space</td>
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<td>New AP Physics Exams: PER &amp; National Assessment</td>
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<td>Wonderful Ideas Book club</td>
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<td>Introduction to Data Science with R-Studio</td>
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<td>Encouraging Wonderful Ideas about Functions of Several Variables in Multiple Physics Contexts</td>
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<td>Juried Talks I</td>
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<td>9:45 AM</td>
<td><strong>Poster Session III (+ coffee), PERLOC office hours</strong></td>
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<td>10:45 AM</td>
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<td>Prosperity, Family &amp; Identity: What Helps Women of Color Thrive</td>
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<td>Making Sense of Physics Sensemaking</td>
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<td>Community Resources for Research &amp; Collaboration</td>
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<td>Identifying Conceptual Resources for Physics</td>
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<td>Student Leadership and Ownership in Equity Work: Insights from Access Network</td>
<td>Grand North</td>
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<td>12:15 PM</td>
<td><strong>Lunch Plenary Talk: Déana Scipio</strong></td>
<td>Renaissance Ballroom</td>
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<td>1:30 PM</td>
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<td>Introducing Computation in High School Physics</td>
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<td>What Can Be Achieved by Building on Ideas</td>
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<td>Techniques for Studying Informal Physics Programs</td>
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<td>Plenary Panel</td>
<td>Renaissance Ballroom</td>
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<tr>
<td>Closing</td>
<td>Small Group Discussions of Emergent</td>
<td>Meeting Room 2</td>
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<tr>
<td>Activities</td>
<td>Questions</td>
<td></td>
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<tr>
<td>...</td>
<td>Discussion: Implications for Teaching</td>
<td>Meeting Room 3</td>
</tr>
<tr>
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<td>Art/Music Room</td>
<td>Meeting Room 4</td>
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Introduction

Papers published in the 2018 Physics Education Research Conference Proceedings consist of two categories, one plenary paper and peer-reviewed papers.

The plenary paper was contributed by one plenary speaker, Dr. Benedikt W. Harrer.

The peer-reviewed papers are written products of any presentation including the juried talks, parallel sessions, and poster sessions. Each paper undergoes a rigorous peer review process in order to be published in the Proceedings. This year saw 153 submitted manuscripts, of which 113 were accepted for final publication.

The readership of the Physics Education Research Conference Proceedings includes faculty, post-doctoral associates, and graduate and undergraduate students in physics education; scholars in other discipline-based science education or closely related fields, such as cognitive science; practitioners in physics or other sciences, such as teaching faculty at undergraduate and graduate levels, and high school physics teachers.